L.8: Increase of average-powers and pulse-durations of 510.6 and 578.2 nm components of copper bromide vapor laser with addition of hydrogen to neon buffer gas

The copper bromide vapor laser (CBVL) is an efficient source of high power pulsed coherent radiation at 510.6 nm (green) and 578.2 nm (yellow) wavelengths. The output power and efficiency of the CBVL increases by addition of small amounts of hydrogen to the neon buffer gas. The reported studies on the effect of addition of hydrogen to neon buffer gas of the CBVL have highlighted the increase of total output power of the laser however its effect on the spectral components of the output is not reported so far. The power and temporal characteristics of each spectral component of the laser are important in many applications, like sum frequency generation, dye laser pumping, etc. The effect of addition of hydrogen to the buffer gas neon on the spectral and temporal characteristics of an indigenously developed CBVL was studied in Laser Systems Engineering Section of RRCAT. The study was performed on a home-made CBVL, which was operated in sealed-off self-electrical discharge heated mode. The laser consisted of a fused silica discharge tube of 50 mm internal diameter with inter-electrode distance of 1500 mm.

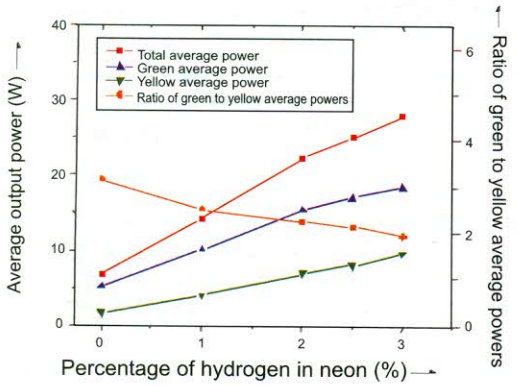

Fig. L.8.1: Variation of total average power, green average power, yellow average power and ratio of green to yellow average powers of the CBVL with variation of percentage of hydrogen in neon buffer gas at input electrical power of 3.6 kW.

The average powers of green and yellow spectral components of the CBVL increased with increase of the percentage of hydrogen in neon buffer gas or the input electrical power but in each case the percentage of yellow component increased more than the percentage of green component. When no hydrogen was added to neon and the laser was operated at an input electrical power of 3.6 kW, the average output power was 6.6 W, which was distributed between green to yellow components in the ratio 3.13. When 3% hydrogen was added to neon but input electrical power remained same (3.6 kW), the average output power increased to 28 W but the ratio of green to yellow components reduced to 1.92, which is shown in Fig. L.8.1.

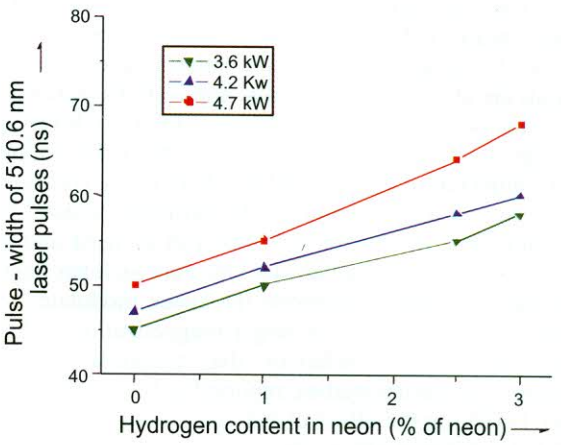

Fig. L.8.2: Variation of pulse-width of green laser pulses with change of percentage of hydrogen in neon buffer gas of CBVL.

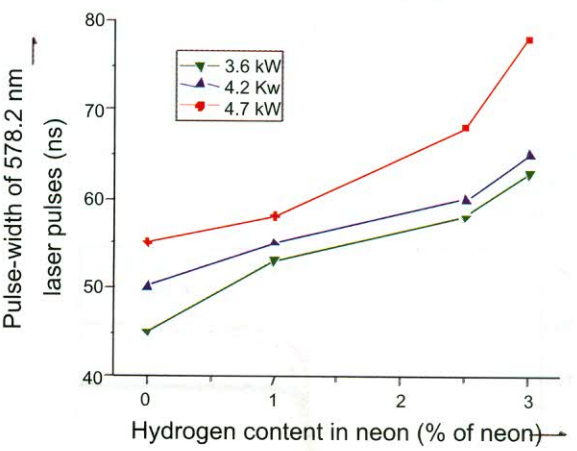

Fig. L.8.3: Variation of pulse-width of yellow laser pulses with change of percentage of hydrogen in neon buffer gas of CBVL.

The addition of hydrogen to neon buffer gas or increase of input electrical power resulted in increasing the pulse durations of both green and yellow components, as shown in Fig. L.8.2 & Fig. L.8.3 respectively. For more details of the present work, please refer to G. N. Tiwari et al., Opt. Commun. 338, 322 (2015).

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